

***Interview Summary***

1. A proposed amendment was submitted for applicant's consideration. Examiner suggested Applicant to amend claims as shown in the Examiner's Amendment below in order to place the application in condition for allowance.

***Examiner's Amendment***

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
3. Authorization for this examiner's amendment was given in a telephone interview with the Applicant's Representative, Cindy S. Kaplan (Reg. No. 40,043), on 13 May 2008.

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**IN THE SPECIFICATION**

Please replace the paragraph starting on page 17, line 10 as below:

FIG. 1 depicts a network device 100 that may be used to implement any of the nodes depicted in FIGS. 2-3 or a network management workstation. In one embodiment, network device 100 is a programmable machine that may be implemented in hardware, software or any combination thereof. A processor 102 executes code stored in a program memory 104. Program memory 104 is one

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example of a computer-readable storage medium. Program memory 104 can be a volatile memory. Another form of computer-readable storage medium storing the same codes would be some type of non-volatile storage such as floppy disks, CD-ROMs, DVD-ROMs, hard disks, flash memory, etc. ~~A carrier wave that carries the code across a network is another example of a computer-readable storage medium.~~

## IN THE CLAIMS

Please replace all claims as shown below:

Claim 1 (currently amended): In a data communication network, a method for protecting a node, said method comprising processes of:

identifying said node to be protected;

allocating a primary bandwidth pool on links of said data communication network for use by primary paths;

allocating a backup bandwidth pool on said links of said data communication network ~~for use as a backup~~, said backup bandwidth pool on each of said links ~~comprising a bandwidth~~ equal to at least a link speed minus a maximum reservable bandwidth for said primary paths on said link;

identifying a link pair traversing said node to be protected, said link pair having a bandwidth to be protected;

establishing as a backup for said link pair a set of one or more backup paths that do not include said node and wherein said one or more backup paths collectively have backup bandwidth greater than or equal to said bandwidth to be protected;

deducting, for each link included in said set of paths, from backup bandwidth available for protecting said node, while not deducting from backup bandwidth available for protecting other nodes in said data communication network; and

repeating said processes of identifying, establishing, and deducting for a plurality of link pairs traversing said node without exceeding available backup bandwidth of links used in establishing said backups;

wherein said bandwidth to be protected of said link pair comprises a lesser of primary bandwidths of links of said link pair traversing said node to be protected.

Claims 2-3 (canceled).

Claim 4 (original): The method of claim 1 wherein said set of one or more paths comprises one or more label switched paths.

Claim 5 (original): The method of claim 1 wherein said processes of identifying and establishing occur under control of said node.

Claim 6 (original): The method of claim 1 wherein said processes of identifying and establishing occur under control of a computer independent of said node.

Claim 7 (original): The method of claim 1 further comprising:  
signaling said backups to other nodes adjacent to said node in said data communication network.

Claim 8 (currently amended): A method for operating a data communication network to provide protection to nodes in said data communication network, said method comprising:

maintaining, for each of a plurality of links in said data communication network, a primary bandwidth pool for use by primary paths and a backup bandwidth pool for use by backup tunnels; and

establishing said backup tunnels to protect a plurality of nodes of said network, each of said backup tunnels consuming backup bandwidth from backup bandwidth pools of selected ones of said plurality of links; and

wherein all backup tunnels protecting any particular node of said network do not consume more bandwidth on any link than provided by the link's backup bandwidth pool but wherein there is at least one set of backup tunnels that protect disparate nodes and that consume more bandwidth on at least one link than provided by said at least one link's backup bandwidth pool, and

wherein establishing backup tunnels comprises signaling said backup tunnels with zero bandwidth to adjacent nodes of each protected node and performing backup tunnel selection computations at each protected node for that protected node.

Claim 9 (original): The method of claim 8 wherein at least one of said backup tunnels comprises a label switched path.

Claims 10-15 (canceled).

Claim 16 (currently amended): In a data communication network, a computer-readable storage medium encoded with a computer program product for protecting a node, said computer program product comprising:

code that identifies said node to be protected;

code that allocates a primary bandwidth pool on links of said data communication network for use by primary paths;

code that allocates a backup bandwidth pool on said links of said data communication network ~~for use as a backup~~, said backup bandwidth pool on each of said links ~~comprising a bandwidth~~ equal to at least a link speed minus a maximum reservable bandwidth for said primary paths on said link;

code that identifies a link pair traversing said node to be protected, said link pair having a bandwidth to be protected;

code that establishes a backup for said link pair a set of one or more backup paths that do not include said node and wherein one or more backup paths collectively have backup bandwidth greater than or equal to said bandwidth to be protected;

code that deducts, for each link included in said set of paths, from backup bandwidth available for protecting said node, while not deducting from backup bandwidth available for protecting other nodes in said data communication network; and

code that repeatedly invokes said code that identifies, establishes, and deducts for a plurality of link pairs connected to said node without exceeding available backup bandwidth of links used in establishing said backups; and

~~a computer-readable storage medium that stores the codes;~~

wherein said bandwidth to be protected of said link pair comprises a lesser of primary bandwidths of links of said link pair traversing said node to be protected.

Claims 17-18 (canceled).

Claim 19 (currently amended): The computer-~~readable storage medium program~~ ~~product~~ of claim 16 wherein said set of one or more paths comprises one or more label switched paths.

Claim 20 (currently amended): The computer-~~readable storage medium program~~ ~~product~~ of claim 16 further comprising:

code that signals said backups to other nodes adjacent to said node in said data communication network.

Claim 21 (currently amended): A computer-readable storage medium encoded with a computer program product for operating a data communication network to provide protection to nodes in the data communication network, said computer program product comprising:

code that maintains, for each of a plurality of links in said data communication network a primary bandwidth pool for use by primary paths and a backup bandwidth pool for use by backup tunnels; and

code that establishes said backup tunnels to protect a plurality of nodes of said network, each of said backup tunnels reserving backup bandwidth from backup bandwidth pools of selected ones of said plurality of links;

wherein all backup tunnels protecting any particular node of said network do not consume more bandwidth on any link than provided by the link's backup bandwidth pool but wherein there is at least one set of backup tunnels that protect disparate nodes and that consume more bandwidth on at least one link than provided by said at least one link's backup bandwidth pool; and

wherein code that establishes backup tunnels comprises code that signals said backup tunnels with zero bandwidth to adjacent nodes of each protected node and code that performs backup tunnel selection computations at each protected node for that protected node

; and

~~a computer-readable storage medium that stores the codes.~~

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Claim 22 (currently amended): The computer-readable storage medium ~~program~~  
~~product~~ of claim 21 where at least one of said backup tunnels comprises a label  
switched path.

Claims 23-24 (canceled).

Claim 25 (currently amended): A network device for implementing a node in a  
data communication network, said network device comprising:

a processor; and

a memory storing instruction for said processor, said instructions comprising:

code that identifies said node to be protected;

code that allocates a primary bandwidth pool on links of said data communication  
network for use by primary paths;

code that allocates a backup bandwidth pool on said links of said data  
communication network ~~for use as a backup~~, said backup bandwidth pool on each of  
said links ~~comprising a bandwidth~~ equal to at least a link speed minus a maximum  
reservable bandwidth for said primary paths on said link;

code that identifies a link pair traversing said node to be protected, said link pair  
having a bandwidth to be protected;

code that establishes a backup for said link pair a set of one or more backup  
paths that do not include said node and wherein one or more backup paths collectively  
have backup bandwidth greater than or equal to said bandwidth to be protected;

code that deducts, for each link included in said set of paths, from backup bandwidth available for protecting said node, while not deducting from backup bandwidth available for protecting other nodes in said data communication network; and

code that repeatedly invokes said code that identifies, establishes, and deducts for a plurality of link pairs connected to said node without exceeding available backup bandwidth of links used in establishing said backups;

wherein said bandwidth to be protected of said link pair comprises a lesser of primary bandwidths of links of said link pair traversing said node to be protected.

Claims 26-27 (canceled).

Claim 28 (original): The network device of claim 25 wherein said set of one or more paths comprises one or more label switched paths.

Claim 29 (original): The network device of claim 25 wherein said instructions further comprise:

code that signals said backups to other nodes adjacent to said node in said data communication network.

Claim 30 (currently amended): A network device for implementing a node in a communication network, said network device comprising:

a processor; and

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a memory storing instruction for said processor, said instructions comprising:  
code that maintains, for each of a plurality of links in said data communication network a primary bandwidth pool for use by primary paths and a backup bandwidth pool for use by backup tunnels; and

code that establishes said backup tunnels to protect a plurality of nodes of said network, each of said backup tunnels reserving backup bandwidth from backup bandwidth pools of selected ones of said plurality of links;

wherein all backup tunnels protecting any particular node of said network do not consume more bandwidth on any link than provided by the link's backup bandwidth pool but wherein there is at least one set of backup tunnels that protect disparate nodes and that consume more bandwidth on at least one link than provided by said at least one link's backup bandwidth pool;

wherein code that establishes backup tunnels comprises code that signals said backup tunnels with zero bandwidth to adjacent nodes of each protected node and code that performs backup tunnel selection computations at each protected node for that protected node.

Claim 31 (currently amended): The network device of claim 30 where wherein at least one of said backup tunnels comprises a label switched path.

Claims 32-36 (canceled).

Claim 37 (previously presented): The method of claim 1 wherein establishing a set of one or more backup paths comprises performing backup path selection computations at said node to be protected.

Claim 38 (previously presented): The method of claim 1 further comprising dynamically adjusting said established backup paths in response to a change in one or more of said primary paths.

Claim 39 (previously presented): The method of claim 1 wherein said backup paths are established at said node to be protected.

Claim 40 (previously presented): The method of claim 1 further comprising signaling said one or more backup paths with zero bandwidth to one or more other nodes.

Claim 41 (previously presented): The method of claim 8 further comprising identifying a failure at said node to be protected and rerouting traffic, wherein said traffic is rerouted in less than 50 milliseconds.

Claim 42 (previously presented): The method of claim 8 wherein said primary bandwidth pool comprises a maximum amount of bandwidth that is available for allocation to primary paths.

Claim 43 (previously presented): The method of claim 8 wherein said backup bandwidth pool comprises a maximum amount of bandwidth allocated for backup traffic.

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***Allowable Subject Matter***

4. Claims 1, 4-9, 16, 19-22, 25, 28-31, and 37-43 are allowed. The following is an examiner's statement of reasons for allowance: In interpreting the claims, in light of the specification and the authorized Examiner's Amendment on 13 May 2008, the Examiner finds the claimed invention to be patentably distinct from the prior art of record.

5. In regards to statutory subject matter, the Examiner interprets the claim language of "a node" to be hardware as pointed out in page 17, lines 10-19 of applicant's specification which state, "A processor 102 executes code stored in a program memory 104." And the claim language of "a computer-readable storage medium" to be hardware as well as recited in page 17, lines 10-19 which state, "Another form of computer-readable storage medium storing the same codes would be some type of non-volatile storage such as floppy disks, CD-ROMs, DVD-ROMs, hard disks, flash memory, etc."

6. **Kinoshita et al. (2002/0172149)** teaches when setting up a working path, a protection path is automatically set up by taking each node on the working path as a start point. A working path setup request message carrying "protection needed/not-needed" information is transmitted from an ingress node toward an egress node along the route of the working path. When transferring a path setup response message as a

response to it, each node autonomously determines the route of the protection path and sends out a protection path setup request message along the route of the protection path **(Kinoshita, abstract, figure 6, and corresponding text)**.

7. **Jain (2002/0112072)** teaches a system and method for the fast re-routing of data in a data communication network. A protection label path is formed between a base node and an end node wherein the protection path avoids an intermediate node between the base node and the end node. Availability of protection provided by the protection path is advertised within the network. A protected path is formed for communicating data, the protected path passing through the intermediate node. When a fault is detected in the network, the fault is avoided by using the protection path for communicating data. Thus, alternate paths are defined for bypassing entire network nodes. As such, the protection paths allow data to be re-routed so as to avoid failed network nodes as well as failed network links **(Jain, abstract, figure 1, and corresponding text)**.

8. **Shabtay et al. (6,895,441)** teaches a path reroute mechanism for use in communication networks comprising multiple searches for a routing path to restore traffic following a failure that could not be protected by a previously established protection route (i.e. protection tunnel, bypass, etc.) or for routing or rerouting of traffic paths for optimization or any other purpose. Each node advertises TLVs that include bandwidth allocation information used to derive the actual amount of bandwidth available for protection purposes, protected paths and unprotected paths or a portion of this information such as in the case where unprotected paths are not supported.

Searches are performed on larger and larger portions of the available bandwidth until a route for the path is found (**Shabtay, abstract, figure 8, and corresponding text**).

9. **Anderson et al. (2002/0004843)** teaches a system, device, and method for bypassing network changes in a communication network pre-computes recovery paths to protect various primary paths. A fast detection mechanism is preferably used to detect network changes quickly, and communications are switched over from the primary paths to the recovery paths in order to bypass network changes. Forwarding tables are preferably frozen as new primary paths are computed, and communications are switched over from the recovery paths to the new primary paths in a coordinated manner in order to avoid temporary loops and invalid routes. New recovery paths are computed to protect the new primary paths (**Anderson, abstract, figure 1, and corresponding text**).

10. However, the prior art of record fail to teach or suggest individually or in combination the claimed limitations of independent claims 1, 16 and 25, wherein said bandwidth to be protected of said link pair comprises a lesser of primary bandwidths of links of said link pair traversing said node to be protected, correlating to page 13, lines 4-11 of the applicant's specification which state, "In one embodiment, a node is protected by providing backup tunnels for each pair of links traversing the node such that the total bandwidth of the backup tunnels exceeds the primary bandwidth of the link pair, i.e., the lesser of the primary bandwidths of the two links." See also page 14, line 21-page 15, line 9. Furthermore, the prior art of record fail to teach or suggest individually or in combination the claimed limitations of independent claims 8, 21, and

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30, wherein code that establishes backup tunnels comprises code that signals said backup tunnels with zero bandwidth to adjacent nodes of each protected node,

correlating to page 16, lines 14-21 of the applicant's specification which state, "The backup tunnels are preferably signaled using, e.g., the RSVP protocol, although it is possible to employ other protocols such as, e.g., label distribution protocol (LDP) as known in the art. According to one embodiment of the present invention, there is no signaling of backup bandwidth reservation for the backup tunnels—that is the backup tunnels are signaled with zero bandwidth." See also page 14, line 21-page 15, line 9.

11. These limitations, in conjunction with the other limitations in the independent claims 1, 8, 16, 21, 25, and 30 are not specifically disclosed or remotely suggested in the prior art of record. Therefore, claims 1, 4-9, 16, 19-22, 25, 28-31, and 37-43 are allowed.

12. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ranodhi Serrao whose telephone number is (571) 272-7967. The examiner can normally be reached on 8:00-4:30pm, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rupal Dharia can be reached on (571) 272-3880. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/R. N. S./

Examiner, Art Unit 2141

5/16/2008

/William C. Vaughn, Jr./

Supervisory Patent Examiner, Art Unit 2144